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**Carbon Sequestration Potential of Medicinal Plants Used in Siddha Pharmacology:  
A Dual Role in Healing and Climate Mitigation****Thanushiyan, V.<sup>1\*</sup>, Dilakshika, T.<sup>2</sup>**<sup>1</sup>*Department of Gunapadam, Faculty of Siddha Medicine, Trincomalee Campus,  
Eastern University, Chenkalady, Sri Lanka*<sup>2</sup>*Earth Resource Engineer, University of Moratuwa, Katubedda, Sri Lanka  
[\\*thanushiyanv@esn.ac.lk](mailto:thanushiyanv@esn.ac.lk)***Abstract**

Traditional medicine systems like Siddha medicine offer untapped potential for climate change mitigation through their reliance on carbon sequestering medicinal plants, yet this dual environmental therapeutic benefit remains largely unquantified. This study quantified the Above Ground Biomass (AGB), carbon stock, and CO<sub>2</sub> sequestration potential of twelve commonly used Siddha medicinal plants in Trincomalee, Sri Lanka, comparing carbon storage capacity among growth forms to identify priority species for climate-smart herbal cultivation. Field data collection was conducted over four weeks (June-July 2025), measuring Girth at Breast Height (GBH), Diameter at Breast Height (DBH), and tree height for five tree species (*Terminalia arjuna*, *Azadirachta indica*, *T. bellirica*, *Phyllanthus emblica*, and *Strychnos potatorum*), five shrub species (*Caesalpinia bonducella*, *Ricinus communis*, *Adhatoda vasica*, *Cassia alata* and *C. auriculata*), and three herbaceous species (*Alpinia galanga*, *Zingiber officinale* and *A. officinarum*). AGB was calculated using standard allometric equations, carbon stock estimated at 50% of AGB, and CO<sub>2</sub> sequestration potential determined using molecular weight ratios. Statistical analysis revealed significant differences in carbon sequestration among species ( $F_{11,48}=42.73$ ,  $p<0.001$ ) and growth forms ( $F_{2,9}=156.8$ ,  $p<0.001$ ). *T. arjuna* demonstrated the highest individual sequestration potential (340.2±25.1 kgCO<sub>2</sub>eq per plant), followed by *A. indica* (219.8±75.6 kgCO<sub>2</sub>eq per plant). Tree species exhibited superior individual performance (mean: 175.6±89.4 kg CO<sub>2</sub>eq per plant), while area-based calculations revealed competitive sequestration rates: trees (52.7-136.1 tCO<sub>2</sub>eq ha<sup>-1</sup>), shrubs (41.7-92.0 tCO<sub>2</sub>eq ha<sup>-1</sup>), and herbs (17.6-46.2 tCO<sub>2</sub>eq ha<sup>-1</sup>). Compared to previous studies on medicinal plants, these sequestration rates are comparable to or exceed those reported for *Andrographis paniculata* (0.8-2.1 tCO<sub>2</sub>eq ha<sup>-1</sup>) and approach conventional agroforestry systems (40-150 tCO<sub>2</sub>eq ha<sup>-1</sup>), demonstrating the significant climate mitigation potential of medicinal plant cultivation. This study provides scientific evidence supporting the integration of Siddha medicinal plant cultivation into climate mitigation strategies while maintaining traditional therapeutic practices, establishing a framework for climate-smart cultivation that serves dual purposes in healthcare delivery and environmental conservation.

**Keywords:** *Carbon sequestration, Climate mitigation, Environment, Medicinal plants, Siddha pharmacology*